



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/619,911	07/15/2003	Bing Ji	06438 USA	7165

23543 7590 08/09/2006

AIR PRODUCTS AND CHEMICALS, INC.
PATENT DEPARTMENT
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 181951501

EXAMINER

TRAN. BINH X

ART UNIT	PAPER NUMBER
	1765

DATE MAILED: 08/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/619,911	JI ET AL.
	Examiner Binh X. Tran	Art Unit 1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 18 May 2006.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-3,5-7,9-15,17-19 and 26-39 is/are pending in the application.
- 4a) Of the above claim(s) 9-15,17-19 and 34-39 is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-3,5-7 and 26-33 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) 1-3, 5-7,9-15,17-19 and 26-39 are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____.
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 9-15, 17-19 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 8-22-2005. (See the examiner's previous response to applicant's traversed for further detail [i.e. office action mailed on 11-23-2005]). Further, the applicants use the identifier "Original" for claims 9-15, 17-19 in the amendment filed on 5-18-2006. This is incorrect claim identifier. Claims 9-15, 17-19 should be labeled as "Withdrawn", since they are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species (See previous office action for further detail).
2. Newly submitted claims 34-39 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The new submitted claims drawn to the method classify under class 216 subclass 67 (Group II). It is noted that the applicants elected group I (i.e. composition) in previous response to the examiner's election/restriction requirement.
3. The following paragraph will explain the reason for restricted the newly submitted claims 34-49.

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-3, 5-7, 9-15, 17-19 drawn to product (i.e. composition), classified in class 252, subclass 79.1. (Note: Applicants elected group I, in the response filed on 8-22-2005)
- II. Newly submitted claims 34-39, drawn to process, classified in class 216, subclass 67.

4. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the product as claimed can be used in a materially different process such as using a gas mixture as an etchant for etching conductive material.

5. The elected group I comprises a plurality of species (See election/restriction requirement mailed on 7-20-2005 for further detail). It is noted that applicant elected species "diacyl fluoride" in the response filed 8-22-2005.

6. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 34-39 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Objections

7. Claim 7 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. In claim 1, the applicants claimed the "ratio by volume of the oxidizer to the unsaturated oxygenated fluorocarbon ranges from 0:1 to 1.0:1". (emphasis added). However, in the dependent claim, applicants try to broaden to this ratio by recites the ratio is in the range "0:1 to 5:1". Once applicants narrow the range from 0:1 to 1:1 in the independent t claim (i.e. claim 1), applicants cannot broaden the range in the dependent claim (i.e. claim 7).

8. Claim 33 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Claim 26 is a product claim (i.e. composition or mixture). In claim 26 applicants disclose the intended of use of the etching mixture (i.e. "etching dielectric material) in the preamble. In claim 33, applicants further disclose the specific dielectric material of the intended use for the etching mixture. According to the MPEP 21 11.02, "If the body of a claim fully and intrinsically sets forth all of the limitation of the claimed invention, and the preamble merely states, for example, the purpose or intended use of the invention, rather than any distinct definition of any of the claimed invention's limitations, then the preamble is not considered a limitation and is of no significant to claim construction". In claim 33, applicants clearly recite the intended use. As discussed above, the examiner does not give any patentable weight on the intended use. Thus, claim 33 fails to further limit the subject matter of the mixture in claim 26.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claim 32 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 32 depends on claim 27. In claim 27, the applicant claims the volume ratio of oxidizer to the unsaturated oxygenated fluorocarbon range is greater than 0:1 (i.e. > 0:1). Since the volume ratio is greater than zero, the percentage of oxidizer must be greater than 0%. The percentage of oxidizer cannot be equal to zero. However, in claim 37, applicants provide a contradicted limitation by indicating that the mixture comprises 0 to 99% volume of the oxidizer (emphasis added).

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 1-7, 26-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent

protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 1 recites the broad recitation "when x is a number ranging from 3 to 10...z is 1", and the claim also recites "when the unsaturated fluorocarbon is a diketone, the x is a number 4 to 10" (note a diketone has $z = 2$) which is the narrower statement of the range/limitation. It is noted that applicants defines in page 8 the specification a diketone having $x = 4-10$ and $z=2$ (emphasis added). However, as discussed above, in claim 1, applicants discloses that "when x is a number range from 3 to 10, z is 1". Therefore, it is unclear what is the value of z, when $x = 4-10$ (Note $x = 4-10$ [narrow range] certainly falls with the range of $x = 3-10$ [broad range]).

Claims 2-7 are indefinite because they directly or indirectly depend on claim 1.

In claim 26, paragraph (i), (ii), (iii), (iv), (vii), (ix), the term "q = 0" lacks antecedent basis because the applicant disclose the formula "CxFyOz" (i.e. there is no symbol "q" in the formula).

Claim 29 recites the limitation "the inert diluent gas" in claim 26. There is insufficient antecedent basis for this limitation in the claim.

Claims 27-33 are rejected under 35 U.S.C. 112, second paragraph because they directly or indirectly depend on claim 26.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

14. Claims 1-2, 5, 7, 26-28, 30, 32-33 are rejected under 35 U.S.C. 102(b) as being anticipated by Nikoh et al. (US 5,989,929)

Respect to claims 1 and 26, Nikoh discloses an etching composition comprising an unsaturated fluorocarbon comprising $C_xF_yO_zR_q$ includes $C_6F_4O_2$ (paragraph col. 22 line 30-40). The compound $C_6F_4O_2$ is also known as tetrafluoro-p-benzoquinone or tetrafluoro-1,4-benzoquinone. This compound has the ring structure (See evidence by chemexper.com in prior art made of record below). The compound $C_6F_4O_2$ read on the formula of diketone comprises a ring structure having the generic formula $C_xF_yO_zR_q$ wherein $x = 6$, $y = 4$ (less than $2x-q$), $z = 2$, $q = 0$. Since $q = 0$, the examiner can

interpret that R is a hydrogen atom, hydrocarbabyl group or a halohydrocarbyl group. It is noted that the ratio of F atoms to C atoms equal to $4/6 = 2/3$ which is less than 2. Respect to claims 1 and 7, Nikoh discloses it is possible to use 0 sccm flow rate for oxygen (Table 1). When the flow rate equal to 0 sccm, the volume ratio of oxidizer to unsaturated fluorocarbon equal to 0:1. Respect to claims 27 and 32, Nikoh further discloses the oxygen gas is at the flow rate corresponds to the 5% of fluorocarbon or oxygenated fluorocarbon (col. 19-20, col. 22). It is noted that $5\% = 5:100 = 1:20$ (within applicant's range of 0:1 to 5:1, or > 0:1 to 20:1)

Respect to claims 2 and 28, Nikoh discloses the mixture comprise inert gas such as argon, neon, xenon, helium, krypton (col. 20 lines 44-45). Respect to claims 5 and 30, Nikoh discloses the oxidizer is at least one selected from the group consisting of oxygen, CO and CO₂ (col. 22 lines 27-30).

Respect to claim 33, Nikoh discloses the dielectric material comprises silicon dioxide (col. 12 lines 18-28).

15. Claims 1-2, 5, 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Mimura et al. (US 2004/0097079).

Respect to claim 1, Mimura discloses an etching composition comprising an unsaturated fluorocarbon comprising C_xF_yO_zR_q includes C₄F₆O₂ (paragraph 0058-0059). The compound C₄F₆O₂ read on the formula of diketone having the generic formula C_xF_yO_zR_q wherein x = 4, y = 6 (less than 2x-q), z = 2, q = 0. Since q = 0, the examiner can interpret that R is a hydrogen atom, hydrocarbabyl group or a

halohydrocarbyl group. It is noted that the ratio of F atoms to C atoms equal to 6/4 = 1.5 which is less than 2.

Respect to claim 2, Mimura discloses the mixture comprise inert gas such as argon or helium (paragraph 0068-0069). Respect to claim 5, Mimura discloses the oxidizer is at least one selected from the group consisting of oxygen (col. paragraph 0068).

Respect to claim 7, Mimura discloses the oxidizer is an optional by indicating any of these gases may be used alone or a plurality of gases among these gases may be used in a mixture (paragraph 0051; read on the ratio of 0:1).

16. Claims 1-2, 5, 7, 26, 28, 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Kubota et al. (US 6,938,638).

Respect to claims 1 and 26, Kubota discloses an etching composition comprising an unsaturated fluorocarbon comprising $C_xF_yO_zR_q$ includes C_5F_8O (col. 7 lines 55 to col. 8 line 2). The compound C_5F_8O is also known as epoxyperfluorocyclopentene (See evidence by Celerity.net, Recommended Operating Pressure for all gases). The compound C_5F_8O read on the formula of epoxy comprises a structure having the generic formula $C_xF_yO_zR_q$ wherein $x = 5$, $y = 8$ (less than $2x-q$), $z = 1$, $q = 0$. It is noted that the ratio of F atoms to C atoms equal to $8/5 = 1.6$ which is less than 2. Respect to claims 1 and 7, Kubota discloses it is possible to use unsaturated oxygenated fluorocarbon such as C_5F_8O by itself. If C_5F_8O is used by itself (i.e. 0 sccm O_2), then the volume of the oxidizer to the unsaturated oxygenated fluorocarbon equal to 0:1.

Respect to claims 2, 28, Kubota discloses inert gas includes argon or nitrogen (col. 7 lines 61-63). Respect to claim 5, Kubota discloses the oxidizer includes oxygen (col. 7 lines 64-65). Respect to claim 33, Kubota disclose the dielectric material is SiO₂ (col. 8 lines 1-2).

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

18. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

19. Claims 3, 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mimura.

Respect to claims 3 and 6, Mimura fails to disclose the specific volume percentage of inert diluent gas or unsaturated oxygenated fluorocarbon. However, Mimura clearly teach to use inert diluent gas and unsaturated oxygenated fluorocarbon.

Mimura further discloses that the flow rate of inert diluent or fluorocarbon gas is a result effective variable. The volume percentage for each gas depends on flow rate ratio. Therefore, the examiner interprets that Mimura implicitly teaches volume percentage is a result effective variable. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiments to obtain optimal volume percentage for each gas as an expected result.

20. Claims 3, 6, 29, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoh et al. (US 5,989,929).

Respect to claims 3, 6 and 29, 31, Nikoh fails to disclose the specific volume percentage of inert diluent gas or unsaturated oxygenated fluorocarbon. However, Nikoh clearly teach to use inert diluent gas and unsaturated oxygenated fluorocarbon. Nikoh further discloses that the flow rate of inert diluent and unsaturated oxygenated fluorocarbon is a result effective variable by using a mass flow controller (col. 22 lines 30-39). The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiments to obtain optimal volume percentage for each gas as an expected result.

21. Claims 3, 6, 29, 27, 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubota (US 6,938,638)

Respect to claims 3, 6 and 27, 29, 31-32, Kubota fails to disclose the specific volume percentage of inert diluent gas or unsaturated oxygenated fluorocarbon or the volume ratio of oxidizer to unsaturated oxygenated fluorocarbon. However, Kubota clearly teaches to use inert diluent gas and unsaturated oxygenated fluorocarbon and oxidizer. Kubota further discloses that the flow rate of inert diluent and unsaturated oxygenated fluorocarbon and oxidizer is a result effective variable by plurality of valves (14, 17, 25, 26) along with different pipe diameter values. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiments to obtain optimal volume percentage for each gas as an expected result. Respect to claim 30, Kubota discloses the oxidizer is oxygen.

Response to Arguments

22. The applicant's argument with respect to previous claim 1 objection (in page 9) of the remark is persuasive. Thus, the examiner withdraws the previous claim objection with respect to claim 1.

A new ground of claim objections with respect to claims 7 and 33 was set forth to discuss applicants amended claim 7 and new claim 33.

The applicant's argument with respect to the Misra (US 6,242,359) references (pages 10-11 of the remark) is persuasive. Thus, the examiner withdraws the previous 35 USC 102(b) ground of rejection using Misra reference as a prior art.

The applicants argue that the compound $C_3F_4O_2$ and $C_4F_6O_2$ in Mimura (US 2004/0097079) are diacyl chloride (Note the examiner assume the applicants made a typo error "diacyl chloride" for -diacyl fluoride-). According to applicant's, "the present claims do not include diacyl chloride [fluoride]] within the scope". The examiner disagrees with this argument. The examiner clearly recognizes that the amended claim do not include diacyl fluoride within the scope. The examiner also recognizes that the formula $C_3F_4O_2$ is no longer read on applicant's claimed invention. However, the formula $C_4F_6O_2$ still read on the diketone formula $C_xF_yO_z$ wherein $x = 4$, $y = 6$ (less than $2x-q$), $z = 2$ and $q = 0$.

Since applicant's amended claim 1 and added new claims 26-32, the examiner reserves the right to provide a new ground of rejections.

Conclusion

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. Chemexper.com via

<http://www.chemexper.com/index.shtml?main=http://www.chemexper.com/search/cas/527-21-9.html> disclose that compound $C_6F_4O_2$ is known tetrafluoro-p-benzoquinone is a ring structure of diketone.

2. Celerity (via celerity.net), "Recommended Operating Pressures for all gases" (page 8 row 2) discloses that the compound C_5F_8O is known as epoxypfluorocyclopentene.

24. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X. Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Binh X. Tran

NADINE NORTON
SUPERVISORY PATENT EXAMINER
ART UNIT 1765

